

## Parallel Lines and Transversals

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### Goal: Discover relationships between parallel lines when cut by a transversal.

Today we will be exploring the angle measure relationships formed when two parallel lines are cut by a transversal. First, though, let's define our words.

Transversal: A line that intersects two coplanar lines at two distinct points

Parallel Lines: Coplanar lines that do not intersect

*Step 1:* Open Geometers Sketchpad.

*Step 2:* Draw a line. The icon for this has the arrows on both ends.

Label the points A and B

How many points must be drawn in order to have a line? 1

*Step 3:* Create a line parallel to  $\overleftrightarrow{AB}$ .

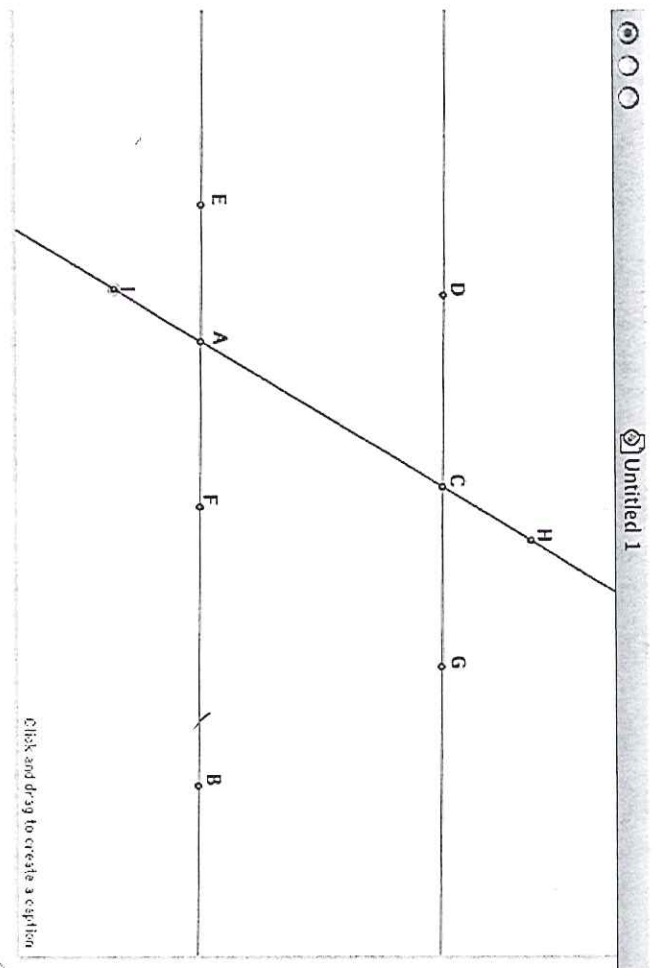
Your parallel line should be about 3 inches away from  $\overleftrightarrow{AB}$ .

Do this by selecting the point tool from the tool bar. Put this point about 3 inches away from  $\overleftrightarrow{AB}$  and put it directly in the middle. Highlight this point, which you should label as C, as well as  $\overleftrightarrow{AB}$  and go to the CONSTRUCT menu. Select PARALLEL LINE.

Your figure should look like the below.

*Step 4:* Construct a transversal through A and C. This will be  $\overleftrightarrow{AC}$ .

You will also construct points on the lines as the following screenshot shows.

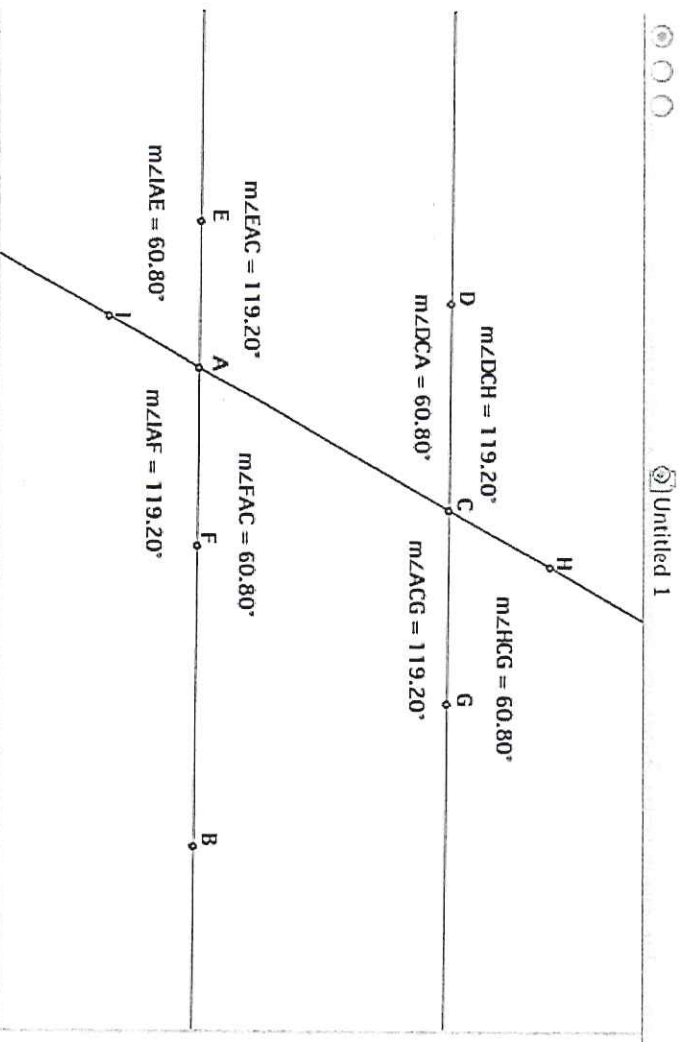


Note: Please make sure your points are labeled exactly the same way. If they were not labeled this way when you clicked on them, please change the letter to the correct label.

*Step 5:* We must now measure every one of our angles. Quickly count how many angles measures there will be.

Remember, when measuring angles you must highlight them in the correct order. For example, if you are finding the  $m\angle DCH$  you must first click on D, then on C, then lastly on H.  
 You will have 8 different angle measures when you are done with this step. Once again, **make sure you select the points in the correct order!!!!!!**

Your screen should look similar to the one below, with exception to the actual angle measures.

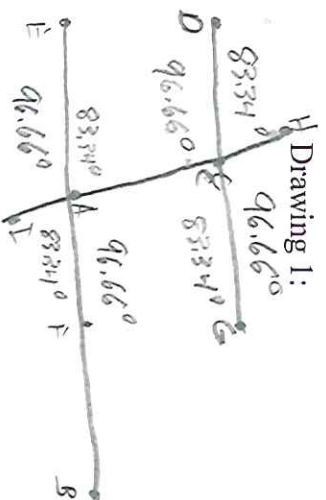


**Step 6:** Record all of your angle measures in the box below. Also, draw a copy and place your angle measures in the angles in the space located below.

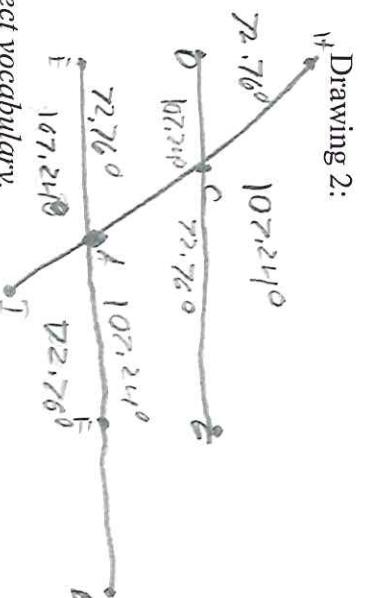
After recording your angle measures once, drag point c to a different part of the screen and record your angle measures a second time.

Angle	DCH	HCG	DCA	ACG	EAC	FAC	IAF	IAE
Angle measure 1	83.34°	96.66°	96.66°	83.34°	96.66°	96.66°	83.34°	96.66°
Angle measure 2	72.76°	107.24°	107.24°	72.76°	72.76°	107.24°	72.76°	107.24°

Drawing 1:



Drawing 2:



**Step 7:** Answer all of these questions using correct vocabulary.

List out all of the vertical angles.

$\angle DCH$  and  $\angle HCG$ ,  $\angle ACD$  and  $\angle HCB$ ,  $\angle EAC$  and  $\angle FAC$ ,  $\angle FAE$  and  $\angle IAC$

What do you notice about angles:

HCG and FAC? They are congruent

DCA and FAC? They are vertical

ACG and FAC? They are supplementary angles

DCH and IAF? They are supplementary angles  
have different angle measures

Write down your conjectures in conditional statements below.

If two angles are adjacent, then their angle measures add up to 180°.  
If two angles are on the same side of the transversal and parallel lines, then they will have the same angle measures.

If two parallel lines are cut by a transversal, then corresponding angles will be congruent.

If two parallel lines are cut by a transversal, then same-side interior angles are supplementary.

If two parallel lines are cut by a transversal, then alternate interior angles are congruent.

**Step 8:** Discuss and share your conjectures with a neighbor.  
 Are there any similarities or differences in your conjectures?  
 Explain how you came up with your conjectures.  
 Add comments to your partners conjectures that you feel is necessary.

**Step 9: Extensions**  
 Create another sketch of two parallel lines cut by a transversal.  
 Measure only <sup>one</sup> two of the angles.

Using those two angle measures calculate all of the other 6 angles within your drawing.  
 Use your knowledge of vertical angles, angle-sum postulate, and the conjectures you created.

Please draw your sketch below. Label the angles that you measured using Sketchpad with a star (\*).  
 Drawing:

$$\begin{array}{r} 180.80 \\ - 39.25 \\ \hline 140.75 \end{array}$$

